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- Al
- (1) a 5-6 membered heterocyclic ring system having 1-3 ring heteroatoms, in which the heteroatom is a nitrogen atom, which is substituted with a hydrogen atom, C<sub>1</sub>-C<sub>6</sub> alkyl, (CH<sub>2</sub>)<sub>m</sub>CO<sub>2</sub>H or (CH<sub>2</sub>)<sub>m</sub>CO<sub>2</sub>(C<sub>1</sub>-C<sub>6</sub> alkyl) and the carbon atom of the herocyclic ring system may be substituted with an oxygen atom to form a carbonyl or enolate anion and m is an integer ranging from 0-4;
  - (2) a 5-6 membered carbocyclic moiety substituted with a hydrogen atom or a C<sub>1</sub>-C<sub>6</sub> alkyl group wherein a carbon atom of the alkyl group may be substituted with oxygen to form a carbonyl or enolate anion;
  - (3) a quinoline or isoquinoline group wherein the nitrogen atom is directly bonded to the carbocyclic moiety of formula I;
  - (4) N,N-bisaryl or bis(C<sub>1</sub>-C<sub>6</sub> alkyl) or bisaryl(C<sub>1</sub>-C<sub>6</sub> alkyl) amine wherein the aryl group is a naphthyl or phenyl group which is unsubstituted or substituted with a fluorine atom, bromine atom, chlorine atom, OCH<sub>3</sub>, CF<sub>3</sub>, OH, or C<sub>1</sub>-C<sub>6</sub> alkyl;
  - (5) a heterocyclic ring system having at least one nitrogen atom bonded directly to the carbocyclic ring of formula I and a group Z which is a carbon atom, NR<sup>8</sup>, oxygen atom or sulfur atom wherein R<sup>8</sup> is a hydrogen atom, C<sub>1</sub>-C<sub>6</sub> alkyl, CO<sub>2</sub>H or CO<sub>2</sub>C<sub>1</sub>-C<sub>6</sub> alkyl;

substituent D<sub>1</sub> is a 9-15 membered heterocyclic system comprising a heteroaryl ring system having at least one heteroatom group (U) which is an NR<sup>3</sup> group, oxygen atom, sulfur atom or PR<sup>3</sup> group which is directly bonded to the aryl portion of the heteroaryl ring system and wherein R<sup>3</sup> is a C<sub>1</sub>-C<sub>6</sub> alkyl which may be unsubstituted or substituted with CO<sub>2</sub>H, SO<sub>3</sub>H or salts thereof and wherein the aryl ring may be unsubstituted or substituted with OCH<sub>3</sub>, CF<sub>3</sub>, bromine atom, chlorine atom, fluorine atom, C<sub>1</sub>-C<sub>6</sub> alkyl or OH or a fused ring polycyclic heterocyclic system;

substituent D<sub>2</sub> has the identical heterocyclic system as substituent D<sub>1</sub> except that when U is NR<sup>3</sup>, the nitrogen atom is quaternized to form an amine salt which is neutralized by an enolate anion from A when A is a substituted pyrimidine like moiety or by a

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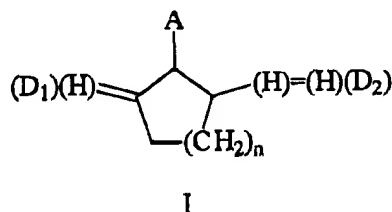
discrete (non intra-molecular) anion, provided that the discrete (non intra-molecular) anion is not a borate anion;

n is an integer ranging from 1-2;

- (b) a hexaarylbiimidazole compound as photoinitiator;
- (c) a photopolymerizable material and a chain transfer agent, or, instead of (c),
- (d) a photoimageable dye.

2. (Amended) A photopolymerizable element comprising:

- (a) a support,
- (b) a photopolymerizable composition comprising
  - (i) a near infrared dye photochemical sensitizer that enables the photopolymerizable composition to undergo effective photopolymerization upon exposure to near infrared radiation, the near infrared dye is a compound of formula I:



wherein A is:

- (1) a 5-6 membered heterocyclic ring system having 1-3 ring heteroatoms, in which the heteroatom is a nitrogen atom which is substituted with a hydrogen atom,  $C_1-C_6$  alkyl,  $(CH_2)_mCO_2H$  or  $(CH_2)_mCO_2(C_1-C_6 \text{ alkyl})$  and the carbon atom of the heterocyclic ring system may be substituted with an oxygen atom to form a carbonyl or enolate anion and m is 0-4;
- (2) a 5-6 membered carbocyclic moiety substituted with hydrogen atom,  $C_1-C_6$  alkyl group wherein the carbon atom of the alkyl group may be substituted with oxygen to form a carbonyl or enolate anion;
- (3) quinoline or isoquinoline groups wherein the nitrogen atom is directly bonded to the carbocyclic moiety of formula I;
- (4) N,N-bisaryl or bis( $C_1-C_6$  alkyl) or bisaryl( $C_1-C_6$  alkyl) amine wherein the aryl group is a naphthyl or phenyl group which is unsubstituted or substituted with fluorine atom, bromine atom, chlorine atom,  $OCH_3$ ,  $CF_3$ , OH,  $C_1-C_6$  alkyl;

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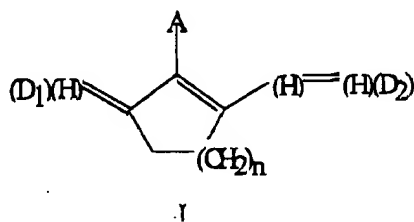
- (5) a heterocyclic ring system having at least one nitrogen atom bonded directly to the carbocyclic ring of formula I and a group Z which is a carbon atom,  $\text{NR}^8$ , oxygen atom, or sulfur atom wherein  $\text{R}^8$  is a hydrogen atom,  $\text{C}_1\text{-C}_6$  alkyl,  $\text{CO}_2\text{H}$  or  $\text{CO}_2\text{C}_1\text{-C}_6$  alkyl;

substituent  $\text{D}_1$  is a 9-15 membered heterocyclic system comprising a heteroaryl ring having at least one heteroatom group (U) which is an  $\text{NR}^3$  group, oxygen atom, sulfur atom, or  $\text{PR}^3$  group which is directly bonded to the aryl portion of the heteroaryl ring system and wherein  $\text{R}^3$  is a  $\text{C}_1\text{-C}_6$  alkyl which may be unsubstituted or substituted with  $\text{CO}_2\text{H}$ ,  $\text{SO}_3\text{H}$  or salts thereof and wherein the aryl ring may be unsubstituted or substituted with  $\text{OCH}_3$ ,  $\text{CF}_3$ , bromine atom, chlorine atom, fluorine atom,  $\text{C}_1\text{-C}_6$  alkyl or OH or a fused ring polycyclic heterocyclic system;

substituent  $\text{D}_2$  has the identical heterocyclic system as substituent  $\text{D}_1$  except that when U is  $\text{NR}_3$ , the nitrogen atom is quaternized to form an amine salt which is neutralized by an enolate anion from A when A is a substituted pyrimidine like moiety or by a discrete (non intra-molecular) anion, provided that the discrete (non intra-molecular) anion is not a borate anion;

n is an integer ranging from 1-2;

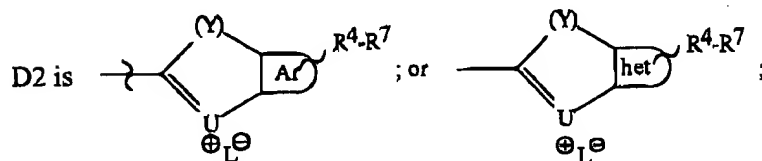
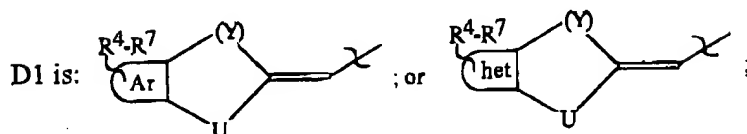
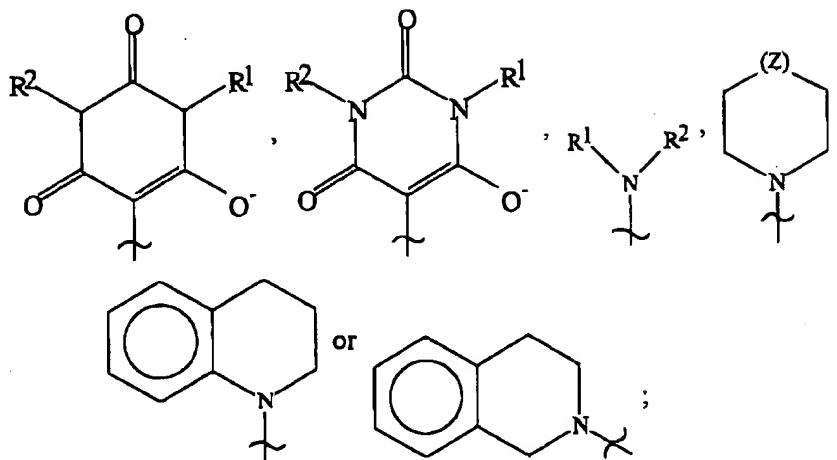
- (c) a hexaarylbiimidazole compound as photoinitiator;
  - (d) a photopolymerizable material and a chain transfer agent; and
  - (e) a binder polymer.
3. (Amended) A near infrared sensitive composition, comprising:
- (a) a near infrared dye photochemical sensitizer that enables the composition to undergo either
    - (i) effective photopolymerization or
    - (ii) effective photoimaging upon exposure to near infrared radiation,
 the near infrared dye is a compound of formula I:



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wherein substituent A is



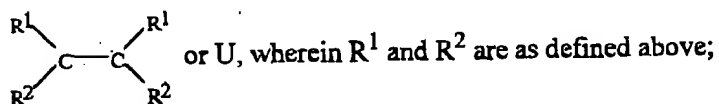
$R^1$  or  $R^2$  are independently selected from H,  $C_1-C_6$  alkyl; or aryl wherein aryl is phenyl or naphthyl which may be unsubstituted or substituted with halogen,  $-O(C_1-C_6 \text{ alkyl})$ ,  $-O\text{aryl}$ , aryl or  $CF_3$ ;  $(C_1-C_6 \text{ alkyl})(C_6-C_{10} \text{ aryl})$ ;

$\text{Ar}$  is an aromatic ring chosen from phenyl or naphthyl;

$\text{het}$  is a heteroaryl ring chosen from benzopyrazine, benzo-1,4-oxazine or benzo-1,4-thiazine.

U is selected from  $NR^3$ , S,  $PR^3$  or O;

Y is selected from  $C(R^1)(R^2)$ ;



$R^3$  is selected from  $C_1-C_6$  alkyl unsubstituted or substituted with  $CO_2H$ ,  $SO_3H$  or salts thereof;

$R^4-R^7$  are independently chosen from H,  $OCH_3$ ,  $CF_3$ , halogen;

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Z is chosen from NR<sup>8</sup>, C, O or S;

R<sup>8</sup> is chosen from H, C<sub>1</sub>-C<sub>6</sub> alkyl, (CH<sub>2</sub>)<sub>m</sub>CO<sub>2</sub>H or (CH<sub>2</sub>)<sub>m</sub>CO<sub>2</sub>(C<sub>1</sub>-C<sub>6</sub> alkyl);

and

m is 0-6;

n is 1-2;

provided that when A contains an enolate anion, a counterion L<sup>⊖</sup> is not present;

(b) a hexaarylbiimidazole compound as photoinitiator;

(c) a photopolymerizable material and a chain transfer agent; or, instead of (c),

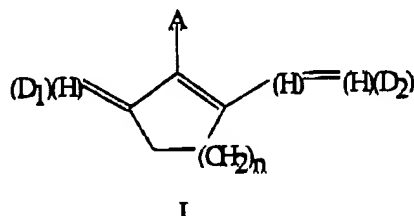
(d) a photoimageable dye.

4. (Amended) A photopolymerizable element comprising:

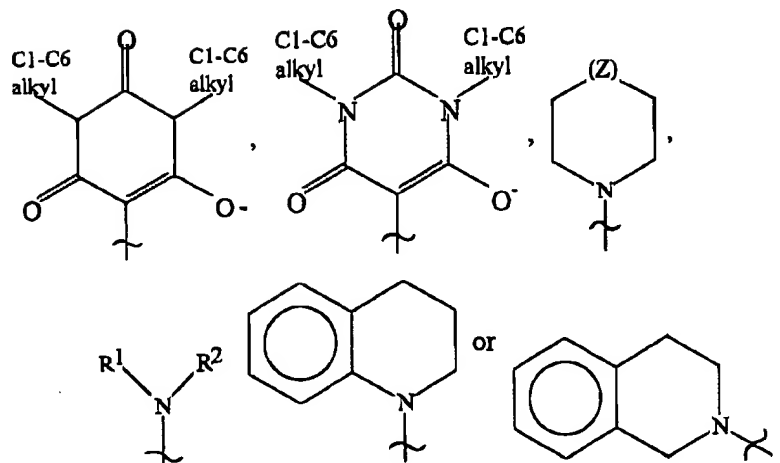
(a) a support;

(b) a photopolymerizable composition comprising

(i) a near infrared dye photochemical sensitizer that enables the photopolymerizable composition to undergo effective photopolymerization upon exposure to near infrared radiation, the near infrared dye is a compound of formula I:



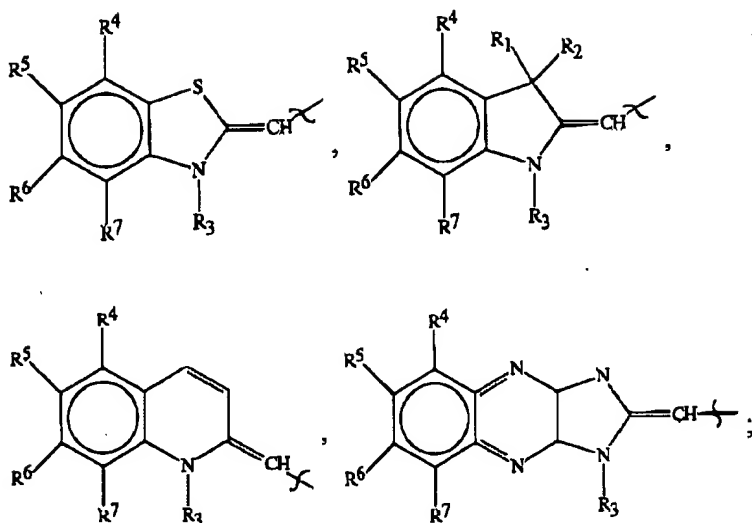
wherein A is



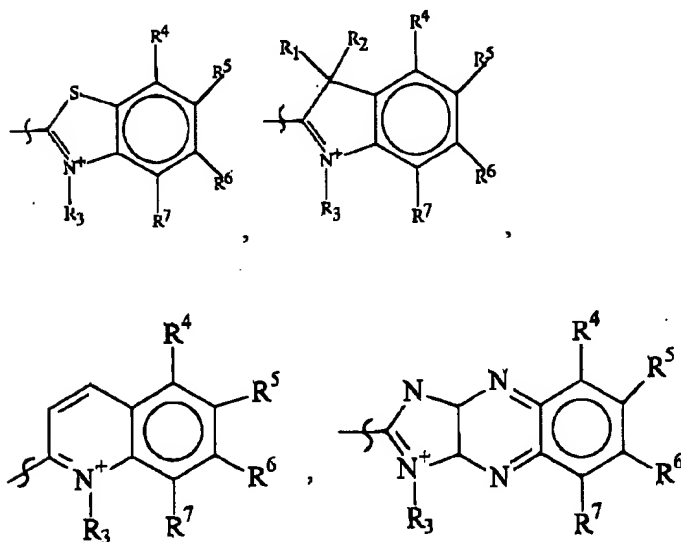
D<sub>1</sub> represents a heterocyclic ring structure selected from the group consisting of:

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D<sub>2</sub> represents a heterocyclic ring structure selected from the group consisting of



R<sup>1</sup> or R<sup>2</sup> are independently selected from:

C<sub>1</sub>-C<sub>6</sub> alkyl, aryl wherein aryl is phenyl or naphthyl which may be unsubstituted or substituted with halogen, -O(C<sub>1</sub>-C<sub>6</sub> alkyl), Oaryl, aryl or CF<sub>3</sub>, (C<sub>1</sub>-C<sub>6</sub> alkyl) aryl or hydrogen;

R<sub>3</sub> is C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonate, C<sub>1</sub>-C<sub>6</sub> alkyloxycarbonyl, C<sub>1</sub>-C<sub>6</sub> alkyl, or C<sub>1</sub>-C<sub>6</sub> alkylcarboxy;

Z is selected from NR<sup>8</sup>, C, O or S wherein R<sup>8</sup> is H, C<sub>1</sub>-C<sub>6</sub> alkyl, CO<sub>2</sub>H or CO<sub>2</sub>(C<sub>1</sub>-C<sub>6</sub> alkyl);

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R<sup>4</sup>-R<sup>7</sup> are independently selected from H, OCH<sub>3</sub>, CF<sub>3</sub>; or any two of R<sup>4</sup>-R<sup>7</sup> which when ortho substituents may join to form a phenyl ring; n is an integer ranging from 1-2 with the proviso that D<sub>2</sub> is selected to be the quaternized heterocyclic ring structure that corresponds to D<sub>1</sub> such that D<sub>1</sub> and D<sub>2</sub> together form a pair of heterocyclic ring structures;

- (c) a hexaarylbiimidazole compound as photoinitiator;
- (d) a photopolymerizable material and a chain transfer agent; and
- (e) a binder polymer.

5. (Amended) A near infrared sensitive composition, comprising:

(a) a near infrared dye photochemical sensitizer that enables the composition to undergo either

- (i) effective photopolymerization or
- (ii) effective photoimaging upon exposure

to near infrared radiation wherein the near infrared dye is selected from the group consisting of DF-1413, DF-1419, DF-1422, DF-1429, DF-1668, DF-15118, DF-15131, DF-15132, NK-3877, GW-826, GW-436, GW-776, GW-976, and NK-2268;

(b) a hexaarylbiimidazole compound selected from the group consisting of o-Cl-HABI, CDM-HABI, 2,3,5-TCl-HABI, and TCTM-HABI; and

(c) a photopolymerizable material selected from the group consisting of tripropylene glycol diacrylate, trimethylolpropane triacrylate, ethoxylated trimethylolpropane triacrylate, propoxylated trimethylolpropane triacrylate, ethoxylated Bisphenol A dimethacrylate, and triethylene glycol dimethacrylate, and a chain transfer agent selected from the group consisting of N-phenylglycine, julolidine, 2-mercaptobenzoxazole, 2,6-diisopropyl-N,N-dimethylaniline, a borate salt and an organic thiol.

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7. (Amended) The composition according to Claim 3, wherein the near infrared dye is selected from the group consisting of DF-1413, DF-1419, DF-1422, DF-1429, DF-1668, DF-15118, DF-15131, DF-15132, NK-3877, GW-826, GW-436, GW-776, GW-976, and NK-2268; the hexaarylbiimidazole compound is selected from the group consisting of o-Cl-HABI, CDM-HABI, 2,3,5-TCl-HABI, and TCTM-HABI; wherein the photopolymerizable material is selected from the group consisting of tripropylene glycol diacrylate, trimethylolpropane triacrylate, ethoxylated trimethylolpropane triacrylate, propoxylated trimethylolpropane triacrylate, ethoxylated Bisphenol A dimethacrylate, and triethylene glycol dimethacrylate, and the chain transfer agent is selected from the group consisting of N-phenylglycine, julolidine, 2-mercaptobenzoxazole, 2,6-diisopropyl-N,N-